wider, on the eastern shore of the lake. As one goes eastward the rainfall appears to diminish slightly. We have no record of the rainfall on the higher mountain ranges directly east of Salt Lake City.

To this we must add that the precipitation on these mountains is undoubtedly larger than in the lowlands. Moreover, there seems to be no record whatever of the amount of rain over the western portion of the lake and its watershed. For accurate and satisfactory study one ought to have river gagings sufficient to determine within 5 per cent the monthly and annual inflow into the lake on all sides instead of the few rainfall measurements that at present so imperfectly represent the rivers and the seepage.

With regard to the evaporation we can do no better than to state that inasmuch as it depends upon the temperature of the lake surface, on the sunshine and cloudiness, on the dryness of the air, and especially on the total wind movement, which latter depends upon both velocity and duration, it must be evident that it is impossible to make an accurate calculation of its total amount unless we have continuous records that are not now available. The best we can do is to make a general application of the investigations by Prof. Thomas Russell. See his Depth of Evaporation in the United States, MONTHLY WEATHER REVIEW, September, 1888, pages 235–239. In this memoir he shows that for Salt Lake City during the year July, 1887 to June, 1888, the depth of evaporation, in inches, from a surface of fresh water kept in a thermometer shelter at the Signal Service station would have been:

	Inches.		Inches.
1888, January	1.8	1887, August	10.7
February	2.7	September	9.6
March	3.6	October	6 5
April	7.2	November	5.0
May	6.9	December	2.3
June	8.9		
1887, July	9.2	Total annual	74.4

What the evaporation from a surface of salt water would have been we do not know.

In the Annual Report of the Chief Signal Officer for 1889, pages 159–172, Professor Russell gives an elaborate study of the rainfall and outflow in the Mississippi Valley showing that in general when the rainfall is heavy a much greater part of it reaches the river than when it is light; the ratio varies from $\frac{1}{2}$ to $\frac{1}{10}$.

It is hardly likely that the sum total of the influences of sunshine and cloudiness, dryness, and wind as affecting evaporation can be combined with the effect of rainfall and run off so as to be expressed by any simple function of the rainfall. But evidently we need more rainfall stations and a more complete record of the seepage through the soil and of the flow of streams into Salt Lake.

HARVARD'S METEOROLOGICAL STATIONS.

In a recent number of the MONTHLY WEATHER REVIEW we have described the important series of meteorological stations maintained during several years past in South America by the astronomical observatory of Harvard College, and extending from the Pacific Ocean to the Desert of Atacama and beyond. We regret to learn that this important work is now discontinued. However, undoubtedly, extensive additions to our knowledge will appear when the results are reduced and published. The following quotation is taken from the fifty-fifth annual report of Prof. E. C. Pickering, director of the observatory:

Meteorological observing stations have been maintained during the year at Mollendo, altitude 100 feet; La Joya, 4,150; Arequipa, 8,060; Alto de los Hiesos, 13,300; Mont Blanc, 15,600; El Misti, 19,200; Vincocaya, 14,600, and Puno, 12,500. Great difficulty has been found in carrying on the observations at the lofty mountain stations. Whenever possible all the stations have been visited once a month by a member of the staff of the Arequipa station, and the self-recording and other instruments compared with various standard instruments, including a mercurial barometer and a psychrometer. Instruments designed and constructed by Señor Muniz, for recording automatically the velocity and direction of the wind, have been placed at all the stations, except those already provided with anemometers. The meteorograph which failed to give satisfactory results at the summit of El Misti has been placed at the Mont Blanc station, and has given records for about one-half of the time. The observations at these different stations have now been continued in many cases for eight or ten years. At such stations, where from the necessities of the case, the observers are generally men of limited education and experience, observations of the greatest accuracy can not be expected, except by maintaining trained observers at greatly increased expense. It is believed that the personal observations which have been secured, and the results of the records of the self-registering instruments, will furnish valuable information to meteorologists concerning a region about which little was previously known. Taking into consideration the striking uniformity of conditions which prevail in different years in this region, it is probable that additional observations would not greatly increase our knowledge. It has been decided, therefore, to suspend, at the end of the year 1900, the meteorological observations of all the stations except those at Arequipa.

REFLECTION BY CLOUDS OF LIGHT FROM A DISTANT FIRE.

Mr. T. S. Outram, Section Director at Minneapolis, Minn., reports that on the evening of March 14, between 9 and 10 p. m.:

A vertical shaft of light of a dull red color, situated about 15° from the zenith was observed bearing about 60° east of north. At that time there was a very brilliant conflagration at the distance of a mile or more in that direction. When first seen the sky for some distance around the shaft of light was partly overcast with fine cirro-cumulus clouds, and above these thin cirro-stratus clouds. The phenomenon was on the higher clouds and was distinctly seen through the ruddy reflection on the cirro-cumulus clouds. Later the cirro-cumuli passed off entirely, leaving the cirro-stratus, which were so thin that a few stars could be seen near the zenith. By 9:30 p. m. the sky was apparently clear, but at that time the shaft of light was so faint that it could hardly be seen. The greatest length of the shaft was equal to the distance between the two outer stars of the bowl of the Great Dipper. During the whole time the wind was north, blowing from 20 to 25 miles per hour.

The above description shows that we have here to do with the reflection of a distant light from the horizontal flat under surfaces of the crystals of snow that usually form cirrus clouds. When the sun is in a proper position near the horizon its rays are similarly reflected and give rise to vertical beams of light that usually form an integral part of solar halos. Of course, these crystals could not maintain their surfaces horizontal unless the air were very quiet, allowing them to settle downward very slowly.

HISTORY OF METEOROLOGY IN BELGIUM.

For sixty-seven years the Royal Observatory of Belgium has regularly published its Annuaire de l'Observatoire Royale, devoted to astronomy and meteorology, but, beginning with the year 1901, it will publish two separate works, viz, the Annuaire Astronomique and the Annuaire Météorologique. These small 16mo volumes will correspond to the quartos, viz, the Annales Astronomiques and the Annales Météorologiques, which began to be published separately in 1881. Magnetic phenomena will be published in connection with the Annuaire Astronomique, since the astronomical director, Dr. L. Niesten, has especially interested himself in this subject and is preparing to continue and publish the magnetic survey carried out by Houzeau and Estourgies in 1878–1882. A monthly magnetic bulletin in 16mo will be published, giving a résumé of the results of the self-registering instruments at the observatory, which is located at Uccle, near Brussels.

The Annuaire Météorologique for 1901 contains, among other interesting articles, a review of the history of meteorology in Belgium by J. Vincent, meteorologist at the observatory, which contains exhaustive references to the literature of the subject, beginning in fact with Charlemagne, who promulgated and established the use of twelve compass points instead of the sixteen now used in the notation of the winds, viz, east, east by south, south by east, south, south by west, west by south, west, west by north, north by west, north, north by east, east by north, all which were sometimes known as the twelve apostles.

The most ancient name that can actually be cited in meteorological matters is Thomas of Cantimpré, who was born in Brabant in the early part of the thirteenth century and was the author of the work Die Naturis Rerum, which was finished about 1250 and often attributed to Albert the Great. The history of modern scientific meteorology in Belgium begins with Simon Stévin, born at Brussels in 1548 and died in Holland in 1620. His ideas as to gravity, hydrostatics, the fall of heavy bodies, the weight of the air seem to have been quite correct. He first gave two methods for determining the elevations of the clouds. In one method, assuming that the cloud is isolated in the sky and almost stationary, he measures the angular altitude of the cloud and takes a corresponding measure of the location of its shadow on the ground. In the second method he makes two measures of the angular altitude, from the extremities of a base line, the cloud being near the zenith. His ideas on geology and other branches of science were generally clear and correct. In Girard's translation of the works of Stévin he interpolates ideas of his own, such as the vesicular theory of cloud particles which was not at all known to Stévin. To another Belgian meteorologist, F. d' Aiguillon, born at Brussels in 1556, we owe the methods of projection known as orthographic, stereographic, and scenographic, as well as investigations into the optical phenomena of the atmosphere. Of later authors Fromondus (or Libert Froidmont), Fienus (or Feyenes), Vendelinus (or Wendelin), F. Linus (or F. Hall), Sluse (or R. F. Walter), L. Gobart, F. Verbiest, J. A. Brown, (born in 1702, died in 1768) are especially mentioned.

A chapter is devoted to the earthquakes observed in Belgium, of which the earliest occurred in the year 330, and the next in 502, but of course only prominent, destructive quakes are mentioned in the early records. At the present time every tremor is recorded by self-registering apparatus and the periodicities, both diurnal and annual, seem to be present.

After a section devoted to fundamental meteorological data and tables of reduction, the Annuaire gives an elaborate account of two ancient meteorological journals, one relating to the period 1778–1810, the other to the period 1807–1850. This is followed by an article on the climate of Ardenne, written at the request of the Belgian Department of Agriculture. These and several essays together make the Annuaire for 1901 an interesting contribution to meteorology.

OFFICIAL STANDARD TIME.

In the Astronomical Annual for 1901 of the Royal Observatory of Belgium, the director, Dr. L. Niesten, says that—

> In the astronomical annals we shall continue to make use of local meantime until that very desirable epoch when astronomers shall agree to substitute civil time for it.

Civil time begins at midnight, and should be counted onward for twenty-four hours; astronomical time begins at noon, and is counted onward for twenty-four hours.

Official time in Belgium is the civil time for the meridian of Greenwich. This is the legal time used by government officials, railroads, and post offices, and may be called public or popular time. The legal time in other countries is stated by Dr. Niesten, on page 159 of this Annuaire, to be as follows:

> Western European time, or the civil time of the Greenwich meridian, is legal in England, Belgium, Holland, and Luxemburg. In Belgium the 24-hour notation has been used since May, 1897, in the post office, telegraph, and telephone departments, as also by the railroads and the navy.
>
> Central European, or one hour east of Greenwich, is legal in Germany, Austria-Hungary, Bosnia, and Herzegovina, the Congo Free State, Denmark, Italy, Servia, Sweden, Norway, and Switzerland. In Italy the hours are counted from midnight on to twenty-four.
>
> The meridian of one hour thirty minutes east of Greenwich is adopted by the railroads and telegraphs in Cape Colony.
>
> Eastern European time, or the meridian of two hours east of Greenwich, is adopted by Bulgaria, Roumania, and Natal, and by the railroads of Turkey in Europe. The meridian of eight hours east of Greenwich is adopted by West Australia.
>
> The meridian of nine hours west of Greenwich is adopted by Central Australia and by Japan.
>
> The meridian of ten hours east has been adopted by Victoria, Queensland, and Tasmania.
>
> The meridian of eleven and a half hours has been adopted by New Zealand.
>
> As is well known, Canada and the United States and Mexico have adopted as standard hours the fifth, sixth, seventh, and eighth west of Greenwich. In Canada the notation from zero to twenty-four continuously has also been authorized.
>
> The 24-hour notation has also been introduced into the railroads of British India, where the fifth and sixth hours east of Greenwich are commonly used as standard meridians.
>
> The eighth hour east of Greenwich would be appropriate to the Philippines, but we do not know that the American authorities have issued any regulations bearing on this point.
>
> The Hawaiian Islands adopt the meridian of ten and a half hours west of Greenwich.
>
> The nations that have not adopted the Greenwich system are as follows:
>
> In Spain the legal hour is that of the meridian of Madrid, or 14*m* 45*s* west of Greenwich; in Spain the 24-hour enumeration has lately been adopted.
>
> Portugal adopts the time of the meridian of Lisbon, or 36*m* 39*s* west of Greenwich.
>
> Russia adopts the meridian of St. Petersburg uniformly for its whole domain, or 2h. 1m. 13s. east of Greenwich.

The above data may differ slightly from that published elsewhere. In fact, it is difficult to gather correct statistics for all parts of the world, and the Editor will be pleased to publish any corrections or additions to this list.

It is important to bear these standards in mind when one wishes to compare the exact time of occurrence of any event that is observed in two different countries. We recall vividly a remarkable discrepancy in the hourly temperature records kept in a certain hospital where the morning readings were made by a subordinate who happened to be a Frenchman, and the afternoon readings by one who happened to be a German. The thermometer was unfortunately graduated in the Centigrade system on one side and the Réaumur system on the other. As a matter of course, the morning records were kept in the former and the afternoon records by the latter system. Nothing was said about this in the published records, and it took the Editor a long time to ferret out the cause of the discrepancies. Doubtless, analogous discrepancies are introduced every day by the differences between sun time, local mean time, and legal standard time. In proportion as we progress toward one absolutely uniform standard of time, such as Greenwich, we shall eradicate discrepancies and increase the accuracy of all work in terrestrial physics.

THE WORK OF THE METEOROLOGICAL INSTITUTE OF PRUSSIA.

The Meteorological Institute of the Kingdom of Prussia, (K. Preussische Meteorologische Institut), directed by Dr. von Bezold, includes: (1) The Central Institut of Berlin, divided into four sections: (*a*) Climatology and miscellaneous; (*b*) atmospheric precipitation and library; (*c*) storms, accidental atmospheric phenomena and instruments; (*d*) aeronautics;